Patent Application of

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For

TITLE: VIBRATION STABILIZING GUIDE WHEEL

CROSS-REFERENCE TO RELATED APPLICATIONS

Not applicable.

BACKGROUND—FIELD OF INVENTION

This invention is a guide wheel that allows consistent vibration free grinding when used with electroplated diamond grinding wheels; segmented diamond grinding wheels and diamond rimmed saw blades.

BACKGROUND—DESCRIPTION OF PRIOR ART

For years, the industry has been using diamond tools to cut and fabricate ceramic tile and natural stone products. These tools are typically used with a portable tile saw that can easily be set up and used on location. All tile saws with a standard arbor size can use a profile wheel to create different profiles or shapes on the edge of the material being installed. The profile wheels are made in several different shapes and sizes. Since the introduction of profile wheels, people have come to realize that even though it is a good idea, their capabilities are extremely limited. The first problem is that all portable tile saws share the same basic design. They have a welded square tube frame that has a

support post located in the back left side of the machine. This support post holds the upper saw assembly in place while the machine is operating. When a saw blade or a profile wheel is being used, the entire upper saw assembly would rise up slightly upon contact with the material and then go down as material is removed. This movement carries the profile wheel up and down creating a rough, inconsistent edge. If a profile wheel is allowed to grind too low, it over grinds the material. If it does not grind enough, the material needs to be further worked. In either case, the machine is constantly moving up and down creating an impossible situation for precision grinding.

The second problem is stone tiles will vary in thickness from one box to another throughout the job. Individual tiles can actually taper in thickness.

The third problem is that natural stone has inconsistencies in material hardness. This allows the profile wheel to remove more material in a soft area and rise up and over a harder one. Even small pieces of debris under a tile being profiled can cause over grind situations. This forces the installer to cut that particular tile into a smaller size to be used elsewhere on the job. It should be appreciated that every natural stone tile is unique and if one is damaged due to over grinding, it cannot be readily replaced.

When a saw blade is being used under these up and down conditions, it causes excessive chipping along the top edge of the tile. This larger or deeper chipping forces the fabricator to grind and polish a deeper bevel on the tile's edge. This ultimately affects the width of the grout line, especially if tiles are being installed very close together. This process is called "little or no grout" installation.

Working with stone is a very slow process. Most material is so hard, only diamonds can be used to remove the material with consistent accuracy. The initial cut or profile grind must be accurate because the polishing process that follows wan not designed to remove material readily. The polishing process was designed to remove surface scratches and bring the stone to a final polish.

SUMMARY

The invention is a guide wheel that is preferably machined from acetate (delrin) and can be used with any diamond grinding wheel or diamond saw blade. When using the guide wheel with a grinding wheel, the size of the guide wheel is determined by the exact point at which the grinding wheel's shape should stop grinding. This eliminates the possibility of over grinding and creates a point from where all shapes can be consistently duplicated. When using the guide wheel with a diamond rimmed saw blade, the size of the guide wheel is determined by two things; the diameter of the saw blade and the thickness of the material being cut. An eight-inch saw blade with a seven-inch guide wheel will have half of an inch of cutting depth. The guide wheel has an alignment groove located on its outside edge. This groove is used by the operator to quickly set the grinding wheel slightly below the top surface of the stone. The guide wheel has a center cavity that holds a heavy-duty roller bearing with two rubber seals. A stainless steel threaded insert is pressed into the center of the bearing. This insert replaces the tile saw's standard arbor nut. When tightened, the threaded insert now holds the profile wheel or the saw blade into place. Now, with the machine on, the center bearing can turn and the guide wheel does not turn due to a small amount of friction applied between the face of the guide wheel and the flat inside surface of the tile saw's blade guard assembly. The friction is controlled by simply adjusting the wing nut that was used to mount the blade guard to the tile saw.

DESCRIPTION

Figure 2 is a cross section of a fully assembled guide wheel. Stainless steel threaded insert (13) is press fit into bearing (12). Threaded insert (13) extends through bearing (12) 1/8th of an inch and lock ring (11) is press fit onto end of threaded insert (13). Once this is done, entire assembly press fits into center cavity of guide wheel (10). Then,

internal snap ring (14) is installed. Note: Bearing (12) must make contact with guide wheel beating seat (19) to ensure proper clearance for snap ring (14).

Figure 4 shows an adjustable wing nut (27) connected to mount bolt (30). This bolt assembly connects the blade guard (26) to the tile saw that is being used.

Figure 4 shows blade guard contact area (16) making contact with the inside of the tile saw blade guard (26). Figure 4 shows clearance (23) between inside of blade guard (26) and the face of threaded insert (13). Figure 4 shows alignment groove (15) making contact with the top outside corner of tile material (25). Figure 3 shows guide wheels tile contact surface area (17) making full contact with the tile material (25). Figure 3 shows zero point (30). Figure 3 shows profile wheel clearance (24) and clearance (20).

Note: Clearance 20 .035 - .040
Clearance 24 .0125 - .130
Alignment groove 15 .125 x .125

Description of stainless steel threaded insert (13)
Figure 1 – Threaded insert (13) has internal threads (18) that are tapped through. Internal threads (18) are the same size as the tile saw arbor nut. Shoulder flange (22) seats up against bearing (12) to ensure proper alignment. Wrench flats (22) are machined into face of threaded insert (13).
Figure 2 – Shows necessary clearance (23) between threaded insert (13) and blade guard contact area (16).

REFERENCE NUMERALS IN DRAWINGS

Guide wheel	10
Lock ring	11
Bearing	12
Stainless steel threaded insert	13

Stainless steel internal snap ring	14
Alignment groove	15
Blade guard contact area	16
Guide wheels tile contact surface	17
Internal threads thru	18
Guide wheel bearing seat	19
Clearance area .035 - .040	20
Wrench flats	21
Shoulder flange	22
Clearance	23
Profile wheel clearance	24
Tile material	25
Blade guard	26
Wing nut	27
Waterfeed tubes	28
Profile wheel	29
Mount bolt	30
Saw blade	31
Blade shaft	32
Extension arm	33

OPERATION

In operation, one could install the system on a standard portable tile saw. First, remove the wing nut (27) and the mount bolt (30) in figure 4. Then the blade guard (26) can be removed and set aside. If necessary, remove stock arbor nut, blade flange and saw blade from machine and set aside. Install the profile wheel (29) as seen in figure 3 onto the machine shaft and thread on the guide wheel (10) until it tightens up against the profile wheel (29) in figure 3. Reinstall blade guard assembly (26) in figure 4 and mount bolt (30) and wing nut (27) in figure 4. Adjust wing nut (27) until inside of blade guard (26) applies enough force to keep the guide wheel (10) from turning easily. Do not over

tighten as this will lock up the guide wheel (10) and cause it to slide across tile material (25). The guide wheel (10) is designed to roll across tile material (25) when in use but the guide wheel (10) should not turn unless there is tile material (25) under it forcing it to turn. Next, adjust the machine down into position until the alignment groove (15) fits into the top corner of tile material (25) in figure 4. Tighten all adjustments so that the machine cannot move from this position. Guide wheel (10) and the profile wheel are now adjusted 1/8th inch below the top surface of the tile material (25) in figure 4.

Move the tile material (25) into position for profiling as in figure 3. Turn on the tile saw and check the guide wheel (10) figure 4 and make sure that guide wheel (10) is not turning. If it is, turn off the machine and tighten wing nut (27) in figure 4 until the inside of the blade guard (26) is applying enough friction against the face of the guide wheel (10) to keep it from turning when the machine is operating. By adjusting profile wheel (29) and guide wheel (10) slightly below the surface of tile material (25) in figure 4, we create a situation where the tile saw will go ahead and raise up when it contacts tile material (25) in figure 3. Because the guide wheel (10) allows us to lock in the grinding height well below the tip surface of tile material (25), we can take advantage of a downward force created when the tile material (25) is rolled under the grinding wheel. This downward energy forces the profile wheel (29) to quickly remove the unwanted material faster with less passes. Guide wheel (10) is also applying a downward force on the edge of tile material (25). This downward force keeps the edge of tile material (25) from vibrating during the grinding process. While all of this is happening, the Delrin or acetate guide wheel (25) is absorbing vibration created by the grinding or sawing process. The acetate also protects the tile material (25) surface from scratches if the blade guard assembly is adjusted too tight (which causes the guide wheel to lock up and slide across the surface of the stone).

Note: When using a profile wheel (29) to remove material as seen in figure 3, the profile wheel (29) applies a force that wants to push tile material (25) out of position. For this reason, I designed an extension arm (23) in figure 5.